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INTRODUCTION OF FRUIT AND NUT CROPS IN MEDIEVAL INDIA

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ABSTRACT

India grows a large variety of fruits and nuts (hard-shelled fruit or seed) which play an important role in the economy of the country. A large number of fruit and nut yielding species grown in India are introductions during the medieval period (1200-1800 A.D.) from foreign countries and centres of origin of cultivated plants. Some of these species introduced have been successful and later became important export crops such as cashewnut and groundnut. Much of the information on the early history of plant introduction is scattered in archaeological accounts, ethnographies, gazetteers and travelogues of several visitors and dignitaries to India, and in the classical works, memoirs and autobiographies of Moghul emperors published during the medieval period. The present account deals with the introduction of fruit and nut crops in India during the medieval period. (1200-1800 A.D.). There is need for collaborative work between the plant systematist, horticulturist, linguist and biohistorian for compilation of an authenticated history of pomology and horticulture in India.

INTRODUCTION

The medieval period from 1201 to 1800 A.D. marks the beginning of the European era of advancement of botanical science. During the Muslim period which may be considered from 1300 to 1700 A.D., many gardens were established in Kashmir, Punjab, Delhi and Agra. The Moghuls planted several spring-flowering trees, shrubs and herbs in their gardens (Babar, 1519; Abul Fazl, 1590). Babar, the first Moghul emperor (1494-1530), introduced gardening techniques of Central Asia and Iran in India. The knowledge of Indian flora in subsequent period from the 16th to the 18th centuries is mainly due to interest in Indian plants by the Portuguese, Dutch, French and British botanists who visited India during this period. Hendrik Adriaan van Rheede (1678-1703) wrote the classical and monumental book on the valuable plant wealth of Malabar, *Hortus Malabaricus*; its first volume was published from Amsterdam on 8th May 1678. With the foundation of the East India Company's Garden (now Indian Botanic Garden), at Sibpur, Calcutta by Robert Kyd, Honorary Superintendent of the East India Company's garden in 1787, botanical researches received detailed scientific attention. Further impetus was added to the botanical activities by the appointment of William Roxburgh as the first official Superintendent of the garden in 1793. Roxburgh (1820-1824) was then the first botanist who attempted to draw up a systematic account of the plants of India and his book *Flora Indica*.

India grows a large variety of fruits and nut yielding species (hard-shelled fruit or seed) which play an important role in the economy of the country. A large number of these species which are not native of India, were brought during the medieval period from foreign countries and centres of origin of cultivated plants. Many of them are introductions from the Old and New World during the medieval period and have later become important export crops such as cashewnut and groundnut. The trade relations existed between India and other Asian countries like Arabia, Burma, China, Indo-China, Malaya and Thailand as early as the 13th century. Many fruits like date, peach,

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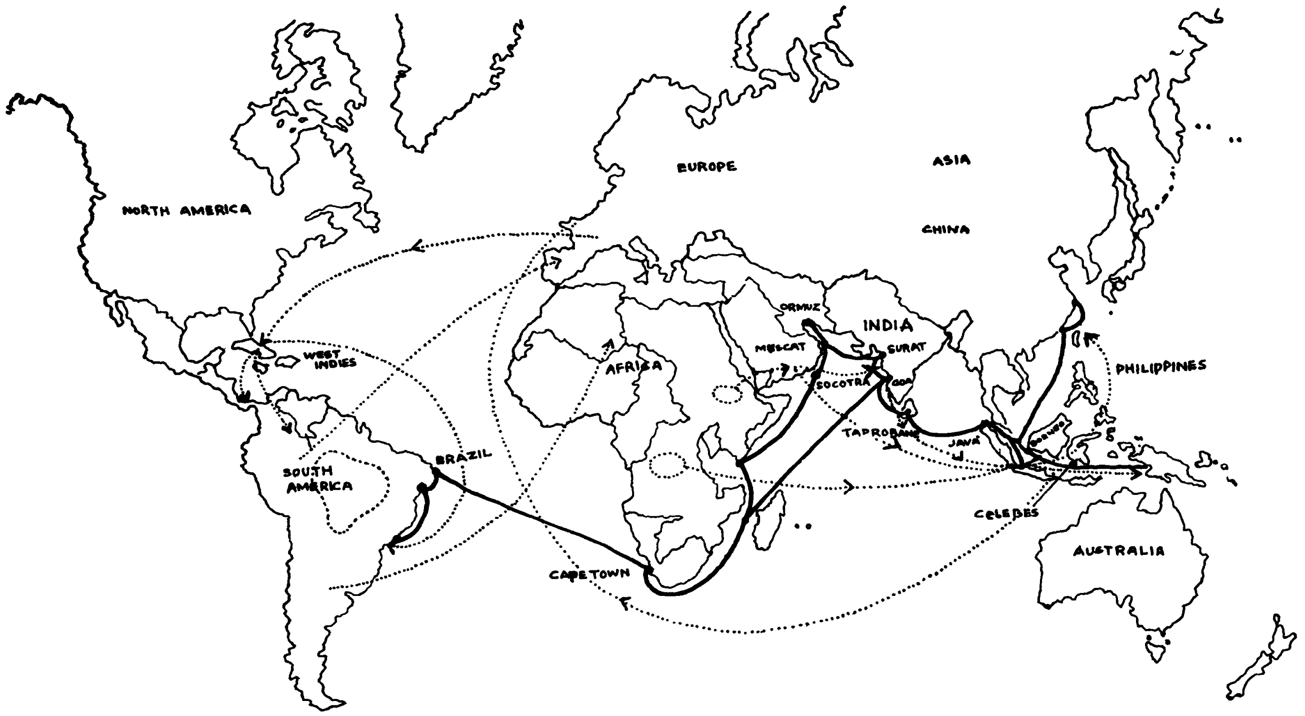
pear, mango, banana and some citrus fruits were then introduced in India. Later, with the discovery of Cape of Good Hope by Bartolomeo Diaz in 1488 and the sea passage to India in 1498 by Vasco da Gama, many other fruits and nut yielding species, and their important varieties were introduced. India benefitted greatly by the introduction of excellent fruits and nuts like papaya. sapodilla, cashewnut, guava, pineapple and sugar apple from Tropical and South America. Litchi and Chinese jujube were introduced from China. The American plants began to spread rapidly to the Old World, moving along the Spanish and Portuguese sea routes which existed from 1500 to 1665 A.D. from Lisbon in Portugal to Brazil, round the Cape to Goa and Surat in India (1510), Malacca (1511), Moluccas (1512), Canton (1515), Japan (1541) and Macao (1557) and other countries in the Far East. Later on, the Dutch, the French and the British also brought many economic plants from South America, Mexico and Africa (Merrill, 1954). Since the Europeans developed contacts both with the New World and the Far Eastern countries, several fruits and nut yielding species like mangosteen, carambola, bilimbi, durian, pummelo, breadfruit, Mabola persimmon and Manila tamarind were introduced from Malaya, Philippines, Java and Molucca, and from the New World into India during the 16th century.

As early as 1883, Alphonse de Candolle in his classic "L' origine des plantes cultiveés" stated the regions of domestication and history of most of the important cultivated plants (De Candolle, 1886). Later on, Vavilov (1949-1950), Zeven and Zhukovsky (1975) and others assembled immense data on the geographic centres of genetic diversity of cultivated plants. These studies indicate that the majority of the more important fruit and nut crops are gifts from the New World tropics. The discovery of the New World in 1492 led to the introduction of several fruit and nut crops into Europe and Asia (Map). It is interesting to note that the world's major fruits and nuts are at present produced in countries far removed from their region of origin, e.g. south-east Asian bananas and limes in the West Indies ; nutmeg from the Moluccas in Grenada ; etc. The American tropics was the home of peanut (groundnut), custard apple, sugar apple, cherimoya, guava, cashew, cacao, sapote, white sapote, sapodilla, star apple, mamey, granadilla and malanga. In Malaysia, the durian, mangosteen, rambutan, pulasan and langsat were native. In south-eastern Asia, the banana, breadfruit, peach, oranges, lemon, etc. were domesticated. The important introductions of fruit and nut crops in Medieval India are : bilimbi, breadfruit, carambola, custard apple, durian, grape, guava, litchi, Mabola persimmon, mangosteen, Manila tamarind, olive, papaya, pineapple, pummelo, sapodilla, sugar apple, cashewnut, groundnut, pistachionut and walnut.

FRUIT CROPS

Fruit crops are of high socio-economic significance in the country. These have been grown in India for thousands of years and occupy today a position of considerable importance. The earliest records of fruits indigenous to the New World have been made in Garcia da Orta's *Os Coloquios* (1565), *Tuzuk-i-Jahangiri* (transl. Rogers and Beveridge, 1909), *Ain-i-Akbari* (Abul Fazl, 1590) and travelogues of several visitors and dignitaries to India (Peter Mundy, 1914). It has been seen how remarkably soon after the european landing in America (1492 A.D.), the pineapple (*Ananas comosus* L.), sugar apple (*Annona squamosa* L.), guava (*Psidium guajava* L.), cashewnut (*Anacardium occidentale* L.) etc. were introduced into India. The Indo-Malesian area is another centre of diversity of tropical fruits. There are a number of introduced species that have adapted themselves for so long



World Map showing maritime routes from the New World to the Old World and *vice versa* during the medieval period.

and so well that few recognize them as exotic plants. Such widely grown fruits and nut yielding species introduced into India from the Old and New World are mentioned below :

BILIMBI (*Averrhoa bilimbi* L.)—This species is a native of Indonesia and the Malay Peninsula. It was introduced by the Portuguese into India probably from the Moluccas. The exact date and place of its introduction is uncertain. In the courtyard of the Portuguese church of Bandel there can be seen some of these plants, having been long ago planted by the friars (Mehra, 1966).

BREADFRUIT (*Artocarpus altilis* Fosberg Syn. *A. communis* J.R. & G. Forster; *A. incisa* L.f.)—The exact centre for the origin of the breadfruit is still not clear. In the literature, the place of origin has been indicated as the Sunda Islands or Malaysia or else as the Pacific. It is one of the most important food sources throughout Polynesia, Micronesia, Melanesia and adjacent areas of the south-eastern Pacific. It was during the first attempt to introduce it in the West Indies during the 18th century that the historic "Mutiny on the Bounty" occurred on the voyage of Captain Bligh. Both seeded (breadnut) and seedless (breadfruit) forms are cultivated throughout the tropics but in most areas the seedless form is more commonly grown and is of considerably greater importance (Jarret, 1959 ; Na Lima Kokua, 1977). Its introduction into India from its native place must have taken place during the Dutch voyages. According to Voigt (1845), it was introduced before 1794 from its native place to the Royal Botanic Garden (now Indian Botanic Garden), Sibpur, Calcutta. Roxburgh (Carey edn., 1832) mentions that it was introduced into Bengal but the particular place is not mentioned. It is not mentioned in the Memoirs of the Moghul emperors. It is cultivated mainly in the southern region of the West Coast for its vegetable fruit. In 1798, Pennant (1798) observed breadfruit in Cochin. It was, therefore, cultivated during the medieval period but did not become popular.

CARAMBOLA (*Averrhoa carambola* L.)—*Vern. name* : Kamrakh. The carambola is a native of the West Indies. It is cultivated over small areas in the hotter parts of India for its sour fruits. Carambola is considered to be native of South-East Asia, Moluccas or of the Malayan region. The fruit is mentioned in Garcia da Orta's *Os Coloquios* (1565) and in the Memoirs of Babar and Akbar, and other travel records. Although the plant can be propagated by seeds, the bud-grafting technique is often employed.

CUSTARD APPLE (*Annona reticulata* L.)—*Vern. name* : Ramphal. The true custard apple is native of West Indies and the tropical American mainland. It seems to have been introduced by the Portuguese during the last quarter of the 17th century. It is not mentioned in the records of Garcia da Orta (1565) and Memoirs of the Moghuls. It is now completely naturalized in West Bengal and South India. The cherimoya (*A. cherimola* Mill.) of South America and the soursop (*A. muricata* L.) of the West Indies are also cultivated but there is no exact record of their introduction into the country.

DURIAN (*Durio zibethinus* Murr.)—The durian, indigenous to Malesia, has been for centuries a favourite fruit in the Malayan region, Burma and the East Indies. It is wild perhaps in Sumatra and Borneo and is now cultivated throughout Indonesia, Sri Lanka, Burma, Thailand, Malaysia and the Philippines. According to Kostermans (1958), perhaps *Durio wyatt-smithii* Kosterm. found in Bukit Bauk Reserve in Trengganu, Malaya, is the wild ancestor of the cultivated durian. It was introduced into India by the Portuguese from Malacca. It is mentioned in Garcia da Orta's *Os Colloquios* (1565) and in the travel records of visitors during the 16th, 17th and 18th centuries. However, it is not mentioned in the Memoirs of the Moghul emperors. Probably it was introduced into Calcutta during the 16th century. It is cultivated in several parts of the country but has been successfully grown in the Nilgiris and along West Coast.

GRAPE (*Vitis vinifera* L.)—The native habitat is unknown, but probably it is native of Caspian and Caucasus region of W. Asia. Grapes have been known in India for about 3000 years. Zafar Khan, Governor of Kashmir during the reign of Shah Jehan (1627-1658) introduced improved varieties of grapes from Iran and Afghanistan. A Grape Garden within the premises of Agra Fort was laid out by Akbar and named as "Anguri Bagh" Viticulture reached its peak in the first half of the 16th century but with the decline of the Moghul empire, it fell into general neglect and was almost wiped out by the middle of the 18th century. At present, grapes are grown commercially, both in Peninsular India (Andhra Pradesh, Maharashtra, Karnataka and Tamil Nadu) and in Northern India (Punjab, Rajasthan, Haryana, Himachal Pradesh and Uttar Pradesh). Several horticultural varieties of grapes are grown in different parts of India, namely Bangalore Blue, Anab-e-shahi, Cheema Sahebi, Perlette, Thompson Seedless, Beauty Seedless and Gulabi.

GUAVA (*Psidium guajava* L.)—*Vern. name*: Amrood ; Piyara. The guava, sometimes called the 'apple of the tropics' is another tropical American fruit that has been cultivated for centuries. It is a typical Mexican introduction *via* the Acapuloc-Manila Galleon route, after 1565 into the Old World tropics. It was introduced into India by the Portuguese. It is not mentioned by Garcia da Orta (1565) and Acosta (1578) which shows that it was not cultivated in the country before the 16th century. It is, however, mentioned in *Ain-i-Akbari* and fruits were served at the table of Emperor Akbar. Guava is a subtropical fruit crop cultivated in Uttar Pradesh, Bihar and Maharashtra. It is mostly propagated by seeds, layering and inarching, but in nature it is dispersed by birds and bats through seeds.

LITCHI (*Litchi chinensis* Sonn. Syn. *Nephelium litchi* Camb.)—This famous and prolific tree of Southern China has been in cultivation in the Far East since time immemorial. It is indigenous to Southern China and possibly to Northern Vietnam. It was introduced into Burma near the end of the 17th century and into India by the end of the 18th century. It was, therefore, not cultivated during the Moghul period which shows that litchi was known before the 18th century, but its cultivation started during later part of the 18th century. It is a subtropical fruit crop growing in Uttar Pradesh, Bihar, West Bengal and other States. Roxburgh reported receiving specimens from old trees in the Garo Hills (Assam), while the trees in Bengal were still small (Hayes, 1960 repr. edn.). Among the cultivars grown commercially in the districts of Saharanpur and Dehradun, Early Large Red, Kalkattia, Dehra Dun and Rose-scented are considered the best (Knight Jr., 1983).

MABOLO PERSIMMON (*Diospyros blancoi* A.DC. Syn. *D. discolor* Willd. ; *D. kaki* Blanco, non Linn. ; *D. philippensis* Gurcke, non A.DC.)—The Mabolo Persimmon, also called as Mabolo or Velvet Apple, is a native of the Philippine Islands where the common name originated. It was misidentified by the botanist Blanco as the Japanese Persimmon, *Diospyros kaki* L. The tree produces a subspherical fruit about 10 cm. in diameter which has an edible white flesh. The plant was first described by Desrousseaux in Lamarck's Encyclopedia in 1792. It was introduced as an edible fruit in the garden of the King in Mauritius in the 18th century. It was widely distributed (possibly from the same garden) and cultivated in the tropics. It was reported in the Indian Botanic Garden, Sibpur, Calcutta in 1811, and is grown in South India (especially in Visakhapatnam), Bihar and Assam.

MANGOSTEEN (*Garcinia mangostana* L.)—The mangosteen, regarded as native of Moluccas, is generally considered to be world's most delicious fruit and is highly prized in regions where it can be grown. It has been termed as 'queen of tropical fruits'. It probably originated from wild plants in the Malay Peninsula and is now widely cultivated in Burma, Indo-China, Sumatra, Java, Bali, the Philippines, tropical Australia and other tropical countries. It was introduced into India by the Portuguese in 1563 from Malacca. It was, however, reintroduced into India during the end of 19th century. It is cultivated in South India, Bombay, Madras and West Bengal as a fruit crop but is hardly popular. It can be propagated by seeds but it will produce fruits only after 10-15 years.

MANILA TAMARIND (*Pithecellobium dulce* Benth.)—*Vern. name* : Jangal jalebi. It is indigenous to Mexico and was introduced by the Spaniards into the Philippine Islands and then into India in 1762 (Maheshwari, 1979). It is commonly cultivated as a hedge plant and is propagated by seeds. Its fruit is edible.

OLIVE (*Olea europaea* L.)—The olive is thought to be native of the Mediterranean region but has been widely introduced throughout the tropics and subtropics. It was introduced into Indian Botanic Garden, Sibpur, Calcutta in *c* 1800, and has become well established in some parts of Northern India. It is propagated by suckers which arise abundantly from the roots of old trees.

PAPAYA (*Carica papaya* L.)—*Vern. name* : Papita. The papaya or pawpaw is indigenous to tropical America. It was not known in India before the arrival of Portuguese who introduced it in the 16th century. It must have reached India before the visit of Linschoten, who began his voyage in 1576 and wrote in 1598, "There is another fruit that came from the Spanish Indies, brought thence by way of the Philippines of Luzon to Malacca and so to India; it is called a papaya and much resembles a melon" (Mehra, 1965-1966). It must have naturalized quickly in India, since in 1656 it was introduced into China as an Indian plant.

PINEAPPLE (*Ananas comosus* Merr.)—The pineapple is indigenous to Brazil and northern parts of South America. The delicious fruit of the pineapple was commented on by the early explorers who landed in tropical America. In 1493 Columbus first saw a pineapple on the island of Guadalupe in the Antilles. It was introduced by the Spaniards and Portuguese to the Old World, and spread all over tropical Asia, Africa, the East Indies and Polynesia. It was introduced into India from Brazil by the Portuguese in the middle of the 16th century. Abul Fazl, the author of *Ain-i-Akbari* (1590) mentioned that the fruit was called *Kathal-i-safari* or travelling Jackfruits, and was regularly served on the table of Emperor Akbar, whilst Emperor Jehangir, the son of Akbar, states in his Memoirs that the pineapple during his time came from the harbour towns held by the Portuguese. Peter Mundy, who visited Agra in 1632, recorded that the fruit was sold in the market (Temple, ed. 1914). At present, it is cultivated in West Bengal, Assam, Madhya Pradesh, Andra Pradesh, Tripura and Bihar. It was propagated from suckers during the medieval period.

PUMMELO (*Citrus grandis* Osbeck Syn. *C. maxima* Merr.; *C. decumana* L.)—The pummelo is a native of Malaya, Polynesia and Indonesia. It was introduied into India and Sri Lanka from Java in the 17th century. Though many other species of *Citrus* are indigenous but pummelo was introduced into this country from other places. It was cultivated in the gardens of Surat and Dumas in Gujarat before the 18th century. The species is now widely spread throughout Malesia, China, India, Iran and other tropical regions. It is usually propagated by marcotting, but can also be grown from seeds and by grafting.

SAPODILLA (*Manilkara zapota* van Royen Syn. *M. achras* Fosberg; *Achras sapota* L.)—*Vern. names* : Sapota; Chikoo; Cheeku. The sapodilla originated in Tropical America and was brought to other tropical areas by the Spanish. Though it was introduced into Sri Lanka in 1802, there is no exact record on its introduction into India. It is not mentioned in the old records like *Babarnama* (Babar, 1519), *Akbarnama* (Abul Fazl, 1590), *Ain-i-Akbari* (Abul Fazl, 1590), *Tuzuk-i-jahangiri* (transl. Rogers and Beveridge, 1909) and Garcia da Orta's *Os Coloquios* (1565). The sapodilla is believed to be a gift of the Portuguese missionary to India. The name sapota seems to have been derived from the native Mexican word *Tzicozapotl* (Mehra, 1965). The cheeku is a Spanish term for this Mexican fruit. It is variously stated to have been brought from Mozambique to Goa, or from Spain to the Philippines, and thence to Malaysia and India. Today, it is cultivated in Uttar Pradesh, West Bengal, Karnataka, Maharashtra, Tamil Nadu and Andhra Pradesh. Generally this plant is propagated by marcotting as well as by grafting.

SUGAR APPLE (*Annona squamosa* L.)—*Vern. name* : Sharifa; Sitaphal. The sugar apple is indigenous to South America and was one of the first American plants introduced into India by the Portuguese during the 16th century. Peter Mundy, a traveller to India, visited Agra in 1632 and saw fruits of sugar apple sold in the market (Temple, ed. 1914). In *Ain-i-Akbari,* translated by Blochmann (1873), sugar apple is mentioned amongst the 'sweet fruits of Hindustan'. Generally it is propagated by seeds or by bud grafting on other species of *Annona.* In Piso's commentary on Bontius (Piso, 1658), it is mentioned under the Brazilian name araticu.

NUT CROPS

The word 'nut' is defined as any hard-shelled fruit or seed, of which the kernel is eaten. Millions of people depend on nuts for the fats and proteins in their diet. The well known nut crops introduced during the medieval period are mentioned below :

CASHEWNUT (*Anacardium occidentale* L.)—*Vern. name* : Caju; Kaju badam. The cashewnut is a native of Brazil and was introduced by the Portuguese in the later half of the 16th century. It is mentioned in Garcia da Orta's *Os Coloquios* (1565). Acosta (1578) found it in the gardens of Santa Cruz in Cochin. Peter Mundy (1914), who visited Goa in 1636, called it as 'Cajoora' and mentioned in the footnote : "this is the cashewnut, a Portuguese introduction of the 16th century". The plant is also mentioned in the written Memoirs of Babar and Akbar. It has become naturalized on the West Coast of India and is now a crop which vies with other commercial commodities like pepper in earning dollars for the country. It is now grown extensively in several parts of the country (Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra, Orissa and Goa). The total area under cashewnut in India is estimated to be about 4 lakh hectares, with an estimated production of 1.4 lakh tonnes of raw cashewnuts. India is the world's biggest exporter of cashew kernels. The U.S.A. and U.S.S.R. are the two major buyers of Indian cashew. The cashew industry thus plays a vital role in India's economy, particularly of the Southern States where the industry is concentrated. The tree is usually grown from the seed, but the vegetative methods of propagation (layering, budding and grafting) are also feasible.

GROUNDNUT (*Arachis hypogaea* L.)—*Vern. name* : Mungphali. The groundnut is a native of Brazil and seems to have been introduced into India in the 16th century, but the exact date is not known. The typical erect types of Brazil with their large nuts were taken by the Portuguese to West Africa, while the Peruvian runner variety with small seeds was introduced across the Pacific through Spanish agency to the Philippines, and later reached Malaysia and China. In India also it appears to have been the latter type that was probably introduced from the Far East. The names such as *chini-badam* and *manila-kottai* which were in use for groundnuts in South India at the turn of the century suggest that it was introduced from the Far East. The first introduction of the groundnut into Malaysia has been recorded as occurring in 1529; and this would suggest a similar date for its introduction into India. However, its Konkani name *mosbimchin biknam* suggests that the Portuguese must have introduced it into the West Coast of India from Mozambique, Africa during the 16th century (Mehra, 1966). The crop found its way to the East Coast about the middle of the 19th century. In 1897, there was a disastrous decline in the yield of groundnut crop which was redressed by the introduction of a new seed from Mozambique to India. This event dramatically raised the production of groundnut and at present 70 lakh tonnes or more are annually produced in the country. It is the most important of the oilseed crops of India.

PISTACHIO NUT (*Pestacia vera* L.)—*Vern. name* : Pistah. Its original home is Syria, Persia and Afghanistan. It was introduced into India from Western Asia and is naturalized in the country. It was cultivated during the time of Abul Fazl and is mentioned in *Ain-i-Akbari* (1590). It is a temperate fruit crop grown to a limited extent in the hilly region of the country.

WALNUT (*Juglans regia* L.)—*Vern. name* : Akhrot. The walnut is native of Iran and Caucasus, and was introduced into Kashmir. It is mentioned in *Ain-i-Akbari* (Abul Fazl, 1590) which indicates that walnut was introduced before or during the early part of the 16th century. The Moghul emperor, Babar introduced some temperate fruits like plum and walnut in Charbagh, Agra during the period 1508-1530. Peter Mundy, a traveller to India, visited Agra in 1632 and saw walnuts sold in the market. It is now grown in Jammu and Kashmir, Himachal Pradesh and Uttar Pradesh, and is propagated through seeds and by inarching.

CONCLUSION

It may be mentioned that the time of introduction of fruit and nut crops is in many cases difficult to determine, as exact records of their introduction are lacking. There were several maritime trade routes during the medieval period which suggest the possibility of more than one point of entry for the same plant species. Since the number of plant introductions was quite considerable, the route and entry point are quite often difficult to establish. Much of the information on the early history of plant introduction is scattered in archaeological accounts, ethnographies, gazetteers and travelogues of several visitors and dignitaries to India, and in the classical works like *Babarnama* or *Tuzuk-i-Babari* (Babar, 1519), *Humayunnama* (transl. Beveridge, 1902), *Tuzuk i-Jahangiri* (transl. Rogers and Beveridge, 1909), *Ain-i-Akbari* (Abul Fazl, 1590), Garcia da Orta's *Os Coloquios* (1565), Acosta's *Tractado* (1578), Rheede's *Hortus Malabaricus* (1678-1703), -Dymock, -Warden and Hooper's *Pharmacographia Indica* (1890), etc. A more detailed search of numerous medieval Sanskrit, Persian, Arabic and Urdu literature and manuscripts stored in botanical gardens, herbaria, musea and libraries needs to be undertaken. The present account offers some working material which it is hoped will stimulate interest in medieval botany and horticulture. There is need for collaborative joint work between the plant systematist, horticulturist, linguist (Urdu, Persian and Sanskrit) and biohistorian for compilation of an authenticated history of pomology and horticulture in India.

A matter of great public concern is that many centres of origin of fruits and nut yielding species the so-called Vavilovian Centres—are located in the developing countries and are disappearing under the impact of habitat loss. The Royal Tropical Institute, Amsterdam, Netherlands has undertaken a study of the genetic resources of tropical and subtropical fruits and tree nuts, covering 55 species belonging to 33 genera and 22 families. The plant genetic resources are the greatest treasure of earth. The humanity at large is concerned with the conservation and utilization of this great heritage. It is the developing countries which constitute the primary and secondary centres of plant genetic diversity. The man-in-the-street is largely unaware that these centres of extreme genetic diversity are absolutely vital to mankind's existence. The study of introduction of fruit and nut crops and other economic plants provides us with a unique opportunity to learn about evolution and variations emerging under domestication and cropping systems, and to save the genetic wealth of a particular crop, country or region.

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